CURRENT SCIENCE

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NATIONAL RESEARCH LABORATORIES

THE decision of the Governing Council of the Scientific and Industrial Research to urge upon the Government of India the imperative necessity for an immediate establishment of six National Research Laboratories with a view to speed up the industrial regeneration of the country, will be enthusiastically welcomed by every section of public opinion in India. The Council has recommended that a Central Fuel Research Station should be established at Dhanbad, which is expected to work in close collaboration with the Indian School of Mines. The subject of fuel is one of fundamental importance to Indian industry in general and to the metallurgical industries in particular. With their characteristic foresight and their reputed generosity, the Tatas have offered to finance the researches on the production of metallurgical coke to the extent of half the expenditure involved. Reserves of coal in India are limited; poor grades are extensive while the metallurgical quality does not occur in sufficient quantity to meet the needs of the comparatively colossal quantities of high quality iron ore.

The Council have also planned the organisation of a National Metallurgical Laboratory which is to be, in all appropriateness, located at Jamshedpur. The Research Laboratory will be associated with, and draw its inspiration from, the great Iron and Steel Works of the Tatas and make use of the facilities offered by the laboratories of the Government Metallurgical Inspectorate. A central Glass Research Institute is the third which has been proposed; its location is not yet decided. The Institute will engage itself on problems connected with glass technology and conduct researches on the production of high grade laboratory, ampoule and optical glasses. The National Physical Laboratory, which, in the first instance, will house the Institute for Radio Research, and the National Chemical Laboratory, complete the six for which the plans are being drawn up. The Tatas, whose munificence has brought into existence the first post-graduate Research Institute of Bangalore, have offered to make a grant of eight lakhs and a half on condition that the National Chemical Research Laboratory is located in reasonably close proximity to the great industrial centre of Bombay. This princely offer has been gratefully accepted by the Council and the Laboratory is proposed to be located at Poona.

Considering the vastness of the natural resources with which this country is blessed, and the magnitude of the industrial problems which are awaiting solution, these six National Research Laboratories would appear absolutely inadequate; but they constitute an encouraging start. It is earnestly to be hoped that the Government of India, who have recently begun to appreciate the value and indispensability of Industrial Research in advancing the economic prosperity

of this country, will favourably consider these modest proposals and extend their financial support.

During the last World War, the Western nations became alive to the need of applied research, and directed their attention to the development and organisation of research in relation to the utilisation of their natural resources. England was among the first to establish a Department of Scientific and Industrial Research. She realised her folly of having neglected organised applied research and State aid to research. Germany's far-sighted policy in this direction was brought home to the British Government even under the stress of a war which was being actively prosecuted at the time. Canada and Australia followed the example of their mother-country. India got an Industrial Commission who published a comprehensive report, which recommended the establishment of a Metallurgical Research Institute at Sakchi (Jamshedpur), a central Chemical Research Institute and an Imperial Engineering College.

After carefully examining the industrial deficiencies of India, the Holland Commission drew attention to "the extraordinary extent to which the country is dependent upon sources of supply for the raw materials and manufactured articles necessary in the life of a modern civilized community". The Report stated that "the incompleteness of our existing system of industries, has been subsequently brought into prominent notice by the interference with industrial supplies from overseas due to war. This constitutes a serious national danger, the extent and gravity of which will be more clearly realised if we refer in detail to some of the more important manufactured *materials* or *articles* which are not at present made in India, although the basis of their production exists in the form of raw material." After discussing the availability of the raw materials—mineral, chemical, vegetable and animal—and after emphasising the necessity of establishing industries for the utilisation of these raw materials, the Commission concludes, "The list of industries, though their products are essential alike in peace or war, are lacking in this country, is lengthy and almost ominous. Until they are brought into existence on an adequate scale, Indian capitalists will, in times of peace, be deprived of a number of profitable enterprises, whilst in the event of war which renders transport impossible, India's all-important existing industries will be exposed to the risk of stoppage, her consumers to great hardship and her armed forces to the gravest possible danger." The Report of the Holland Commission was shelved and after the lapse of twenty-five years, the country has realised with bitterness how prophetic these words have been!

During the same period of a quarter of a century, it is heartening to study and reflect how Russia under the ægis of its own free and National Government, evolved her destiny. In 1915, Tsarist Russia was an economically backward country. Her autocratic form of government acted as a brake on the development of her forces of production, which was responsible for her national poverty and economic dependence on the more advanced countries despite her vast natural resources. In other words, Russia found herself very much in the same position as India continues to find herself to-day. Yet, during the short span of twenty-five years, Russia's achievements in the field of science and technology, have astonished the world; she has organised her industries, developed her natural resources and built up an industrial might which has staggered the German armies on the battlefield. She is now reckoned as first-rate power among the nations of the earth. This supremacy, Russia has attained through the hard and patriotic work of thousands of her scientists and technologists who have solved problems of applied research in hundreds of well-equipped and lavishly endowed laboratories of the Soviet Government.

The National Research Laboratories have a great part to play in the future development of the natural resources of this country. We have every hope that the proposals of the Council of Scientific and Industrial Research to establish the six National Research Laboratories will be actively supported by the Government of India.

SHARKS AND SHARK-LIVER OIL

BY
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(*University of Madras*)

SHARK-LIVER OIL is rapidly taking the place of cod-liver oil in this country, owing to war conditions. It is well, therefore, to direct the attention of everyone interested, to some of the problems that have to be solved, if this valuable indigenous industry is to be built up on sound lines, so that, after the war, the need for importing foreign oil would have ceased to exist.

Attempts are being made by the Government of India and some of the maritime Indian States like Baroda and Travancore to encourage and foster production of shark-liver oil. A considerable amount of oil can be obtained from a single liver and the manufacture of sufficient quantities of liver oil and vitamin concentrates is well within the range of practical realities, provided the opportunity now afforded by the war is utilised to the fullest extent to place this industry on a firm footing.

Though correct data are not available, there is every reason to believe that there is an abundant supply of elasmobranchs on the Indian coast. The commonest forms are species of the genera *Scoliodon, Carcharinus, Hemigaleus, Carcharius, Sphyrna, Galeocerdo* and *Cestracion*, mentioned in the order of their relative abundance. Livers of other elasmobranchs such as skates and rays, belonging to the genera *Pristis, Rhyncobatus, Rhinobatus, Dasybatus* and *Trygon* are also tapped for oil.

Much work has already been done on the analysis of the vitamin A content of these fish oils, particularly at the Nutrition Research Laboratories, Coonoor. Potency for vitamin A has been shown to be very high for several species. Sharks like *Carcharinus gangeticus* yield as much as 97,500 I.U. of vitamin A per gramme of oil, while in others it may be as low as 150 I.U. The average value of a number of samples of oil has been found to be 12,000 I.U. per gramme. Compared to this, its vitamin D potency is rather low. The oil that is placed on the market is a standardised product having a vitamin A potency of 1,500 I.U., and a vitamin D potency of 100 I.U. per gramme, the latter being made up by the addition of synthetic vitamin D in the form of calciferol.

While everyone would agree that the industry should be developed with all rapidity, it is at the same time also highly desirable that the biological aspect of the question should not be lost sight of. The demand for elasmobranch livers has greatly increased recently. A visit to the great fishing centres like Pamban, Tuticorin and Calicut gives ample evidence of this. Elasmobranchs which afford material for this valuable oil, are mostly viviparous, *i.e.*, they, like the mammals, bring forth their young ones alive. Several young ones may be borne at a time. Some species of *Scoliodon* give birth to as many as 13-14 embryos. Larger forms of shark like *Galeocerdo* may give birth to as many more embryos. But, here there is no comparison with the millions of eggs produced by the bony fishes.

Fertilisation is internal and the period of gestation is pretty long, lasting for several months, and in some cases even extends to over an year, the embryos being retained in the uteri till they are considerably advanced in development. These are characters which set a natural limit on their multiplications. The question, therefore, should be asked whether it is not wise, even at this stage, to start thinking as to the ways and means necessary to ensure a steady supply of these fishes. In doing so we shall only be profiting by the experience of other countries—experience gained at considerable loss and expenditure. It will be obvious that considering the viviparous condition and the long period of gestation, if female sharks with their young ones are destroyed, wholesale mortality will result. Such destruction, irrespective of sex, size and condition of the animals would spell disaster to the industry, sooner or later.

There is very little liver in the young ones to be of much use, and such livers are very poor in their oil contents. It would, therefore, be agreed that, as far as possible, destruction of fully developed young ones, about to be born, should be avoided. If at the time of capture the period of gestation is very nearly over, the parent readily drops her burden into the sea. *Ætobatis narinari* actually jumps out of water and drops back with a splash to facilitate

emergence of embryos. If, therefore, during the process of handling the captured fish, embryos drop into the boats they should be immediately returned to the sea. There is then a fair chance of several of them surviving, even though birth has been slightly premature.

It is known that these fishes attain maturity only after reaching a definite size, and most of them grow even after maturity, with the liver size and quantity of oil increasing with age and size. We know, for instance, that *Scoliodon sorrakowah* becomes sexually mature when it attains a length of 15" to 18". Similarly *S. dussumieri* reaches a length of 20" to 23" at sexual maturity. Maturity size is not the same for all species of elasmobranchs. Thus, species of *Galeocerdo* grow to a length of 12 to 15 feet and maturity size is correspondingly high. Hence, if it is possible to find a minimum size which will approximate with the first maturity size, destruction of undersized fish can be prevented by legislative restrictions, and, if the minimum marketable size is fixed at a slightly higher level than the first maturity size, it will enable the fish to shed their first brood into the sea, thus automatically ensuring a supply. But our knowledge in regard to the rate of growth and age at sexual maturity of the different elasmobranchs is meagre, and extensive investigations will have to be carried out in biological stations and by the fisheries departments in the country, to make such information available for all the species. A true conception of their age, growth-rate and movements can only be obtained by marking experiments involving co-operation between fishermen and workers in biological stations. Again, we are almost completely in the dark regarding the breeding grounds and the breeding season of the different species. It can only be said that, like many other tropical marine animals, some of them have an extended reproductive period.

Europe and America, where intensive fishing has led to depletion of certain species of fish, have resorted to legislation for conservation and this has resulted in the restoration of such fisheries. A well-known example is the northern Pacific halibut fishery. In Malabar, indiscriminate fishing of *Sardinella longiceps* has given a setback to the supply of sardine oil. On the east coast, *Trichiurus savala* is another which is caught wholesale, many of them in a very immature condition. In India fishing operations are not carried out in any such intensive scale as in the Western countries and Japan, and the problem of overfishing may not be pressing for the bony fishes. But the need for conserving our shark supplies stands on a different footing on account of their viviparous habits, the limited number of young ones produced and the long period of gestation—habits which make them peculiarly liable to quick depletion if indiscriminate methods are adopted.

Any attempt to bring any sort of control on fishing methods must largely depend on the data available in regard to the life-history of the fishes in question. Improved methods of fishing must be employed and active propaganda conducted. Even such a detail as failure to choose a suitable name for a commercial fishery product might lead to prejudice in the public mind. The United States Bureau of Fisheries converted the spiny dog-fish of the Atlantic coast into a valuable asset by changing the name of the fish for trade purposes. People might eat "cat-fish", but are prejudiced against "dog-fish" and so the Bureau changed the name of the latter into "grey-fish", which is 'descriptive, not pre-occupied and altogether unobjectionable'.

There is a vast field for research to acquire further knowledge in regard to the life-histories of the various species of elasmobranchs, their growth-rate, size at maturity and migratory movements. A systematic study of the various forms in regard to their vitamin potencies during different parts of the year and during different phases of their life-history has to be made. There is no doubt that such investigation will result in valuable information which will be helpful in solving the problems that confront us to-day. In this work the Biologist, the Biochemist and the Fishery-Expert can play an equal and honourable part. It will entail long and planned research and meanwhile, the statement of Dr. E. S. Russell "that upto a point you can increase yield by increasing fishing but after this maximum has been reached the more you fish the less weight of fish you catch and that there must be for every fishery an optimum rate of fishing" might well be borne in mind by Government officers and others interested in the welfare of the shark-liver oil industry.

LETTERS TO THE EDITOR

THE MODE OF ACTION OF VITAMIN D

Several hypotheses have been put forward from time to time to explain the mode of action of vitamin D, but none accounts satisfactorily for all or most of the observed phenomena. The earlier view that vitamin D directly influences absorption of calcium from the intestine has been disproved by evidence published by Patwardhan and Chitre.[1] Sufficient evidence on the other hand is forthcoming to show that vitamin D influences the retention of calcium and phosphorus in the body and thereby maintains a proper balance between the needs of the bones and soft tissues. That the vitamin does not influence deposition of bone by local action has been demonstrated by Robison and Rosenheim[2] with bone slices in calcifying solutions. Under these circumstances the suggestion made by Harris[3] that rickets is essentially a disease of blood rather than the bone seems to be worthy of consideration.

Investigation of the concentration of various chemical constituents of blood serum, *viz.*, Ca, P (acid-soluble, total and inorganic), Mg, Cl, total protein, albumin and globulin, total base, etc., in rachitic and normal children showed that apart from calcium and phosphorus of the serum no other constituent underwent any change which could be attributed to the influence of vitamin D.

That calcium and inorganic phosphorus singly or together decrease in vitamin D deficiency is well known. The diminution of total [Ca] without a simultaneous fall in the quantity or a change in the nature of serum protein would result in a decrease of $[Ca^{++}]$ of the serum [McLean and Hastings[4]]. This is followed by the fall of the ionic product of $[Ca^{++}] \times [HPO_4]$ and $[Ca^{++}]^3 \times [PO_4]^2$ leading to a state of undersaturation of the plasma with regard to either of these salts. In 1941, Freeman and McLean[5] showed that in induced rickets in puppies there existed a relation between the ionic product of $[Ca^{++}] \times [HPO_4]$ and calcification at the epiphysis. No such relationship could be found, according to them, with regard to the solubility product of $Ca_3(PO_4)_2$.

Our own observations on clinical rickets amply confirmed by a further study of experimental rickets in puppies show that, in fact, the calcification at the epiphyses and the solubility products of both the above salts are correlated. The critical values for the negative logarithms of the ionic products of $[Ca^{++}] \times [HPO_4]$ and $[Ca^{++}]^3 \times [PO_4]^2$ have been observed to be 5·7 and 23·0 respectively. The corresponding values for rachitic children and vitamin D deficient animals lie above and those for normal children and control animals lie below the critical values. This observation on the influence of vitamin D on the ionic products is significant and the authors feel that it should be capable of being applied to test the state of nutrition with regard to vitamin D, especially as no such test exists at the present moment.

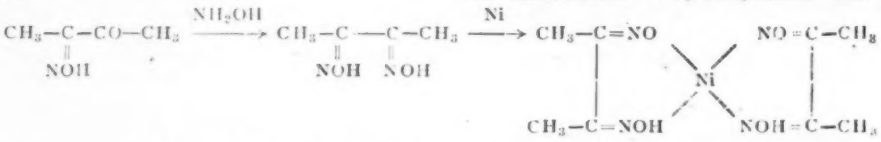
Department of Physiology,
Seth G.S. Medical College, V. N. Patwardhan.
Parel, Bombay, D. R. Sukhtankar.
February 3, 1943.

1. Patwardhan and Chitre, *Ind. Jour. Med. Res.*, 1942, **30**, 81. 2. Robison and Rosenheim, *Biochem. Jour.*, 1934, **28**, 684. 3. Harris, *Lancet*, May 14, 1932. 4. McLean and Hastings, *Amer. Jour. Med. Sci*, 1935, **189**, 601. 5. Freeman and McLean, *Arch. Path.*, 1941, **82**, 387.

THE COLORIMETRIC ESTIMATION OF HYDROXYLAMINE

The several reactions which can be used for the qualitative detection of hydroxylamine have been reviewed by Blom (1928).[1] There exists, however, no satisfactory method for the quantitative estimation of this substance in biological material (*cf.* Lemoigne, *et. al.*, 1935).[2] We describe here a procedure which has been worked out for the colorimetric

estimation of hydroxylamine in the study of nitrogen metabolism in plants. The method is based upon the conversion of hydroxylamine by condensation with diacetylmonoxime to dimethylglyoxime which is then determined by its highly specific reaction with nickel.



By the use of nickel solution oxidised by bromine as employed by Feigl (1924)[3] for the estimation of nickel, the nickel dimethylglyoxime is obtained as a pink solution which can be estimated colorimetrically.

Reagents

A. Hydroxylamine standard, containing 0·01 mg. NH_2OH-N in 1 ml. (4·953 mg. of $NH_2OH.HCl$ in 100 ml.). The solution is neutralised to pH 7·2 with ammonia. The standard is stable for over two weeks. A standard of half this strength can also be used, but with slightly less accuracy.

B. Diacetylmonoxime in N/10 ammonia—3·6 g. dissolved in 10 ml. of N ammonia and diluted with water to 100 ml.

C. Oxidised nickel solution—0·4479 g. of $NiSO_4$, $6H_2O$ in 1 litre. For each estimation 10 ml. of the solution are treated with saturated bromine water added drop by drop till a distinct excess is present. After standing for 15 minutes, N-ammonia is added drop by drop till the excess bromine is decolorized.

Procedure

The test solution containing between 0·025 and 0·075 mg. of hydroxylamine-N is neutralised to pH 7·2 by the addition of ammonia and then treated with 1 ml. of the diacetylmonoxime solution (B). After allowing to stand for half-an-hour at room temperature, 10 ml. of the oxidised nickel solution (C) are added and mixed and after five minutes made up to 25 ml. The rose-red colour which develops is compared with the standard hydroxylamine solution (A), 5 ml. of which are subjected to the same treatment as the test solution.

Table I shows that there is a reasonably good proportionality between colour produced and concentration of hydroxylamine for ranges of concentration from 50 to 150 per cent. of the standard with an error ranging from 0·5 to 3·25 per cent. The smallest concentration of hydroxylamine that can be satisfactorily determined is 0·0005 mg.—N per ml. using a standard of half the strength described above. The errors in this case are slightly higher being of the order of 1 to 4·5 per cent.

The chief conditions for satisfactory results are (1) that the condensation between hydroxylamine and diacetylmonoxime should be carried out at room temperature and a pH of 8·8 to 9, and (2) that a considerable excess (about 150 times the theoretical amount) of diacetylmonoxime should be present. These conditions are satisfied with the quantities and procedure given here. The colour produced is stable for 20 minutes.

In experiments on the hydroxylamine content of root-nodules the method gave 98 per cent. recovery of added hydroxylamine.

Full details with the results obtained on plant materials will be described elsewhere.

Table I

Proportionality between Colour and Hydroxylamine Concentration

Standard and test solution made up to 25 ml. before colour comparison.
Standard: 0·05 mg. NH_2OH—N. Reading of Standard—20.

Test solution (mg. NH_2OH-N)	0·020	0·025	0·030	0·035	0·040	0·045	0·055	0·060	0·065	0·070	0·075
Readings found	..	41·3	34·3	29·3	25·3	22·4	18·3	16·9	15·7	14·6	13·7
Readings calculated	50·0	40·0	33·3	28·6	25·0	22·2	18·2	16·7	15·4	14·2	13·3
% Error (−)	..	3·25	3·00	2·40	1·20	0·90	0·55	1·20	1·94	2·80	3·00

In experiments on the hydroxylamine content of root-nodules the method gave 98 per cent. recovery of added hydroxylamine.

Full details with the results obtained on plant materials will be described elsewhere.

University Biochemical Laboratory, Madras, M. Damodaran.
February 18, 1943. Kerala Varma.

1. Blom, *Biochem. Zeitschr.*, **1928, 194,** 385. 2. Lemoigre M. Monguillon, P., and Desveaux, R., *Compt. Rend.*, 1935, **201,** 1067. 3. Feigl, *Ber.*, 1924, **57,** 758.

GROWTH IN SOME STOMATOPODS

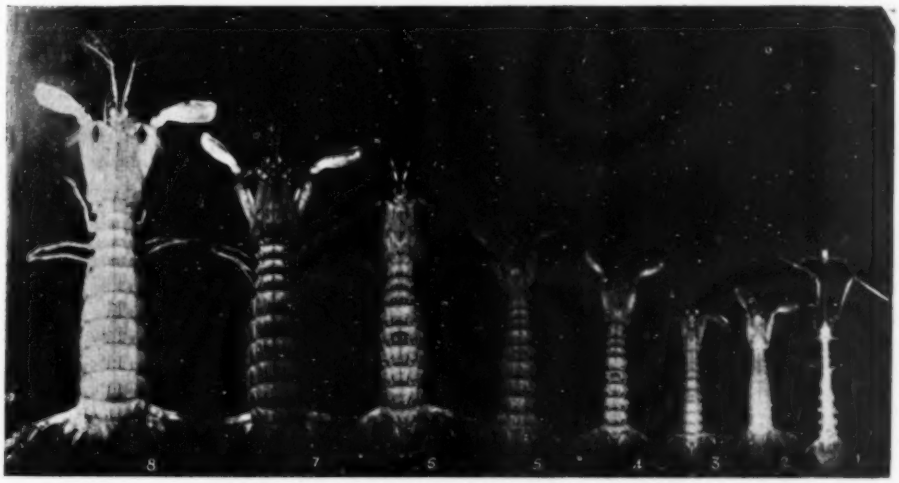
In a previous note[1] we recorded the metamorphosis of the larvæ of five species of *Squilla* and assigned them to their respective species. Since then work on similar lines has been continued and five more species of pelagic larvæ have been successfully reared through their metamorphosis, post-larval and pre-adolescent stages, and have been identified as

Squilla quinquedentata, *S. interrupta*, *S. fasciata* (?), *Lysiosquilla maculata* and *L. multifasciata*. *S. fasciata* and *L. multifasciata* have not hitherto been recorded from this coast of the Bay of Bengal. The occurrence of their larvæ in the plankton on the Madras Coast shows that the adults also are probably inhabitants of this coast.

No precise data are available regarding the rate of growth and age at sexual maturity of any species of Stomatopoda—a group that forms an important item of fisheries in certain parts of the world.[2,3] Attempts were, therefore, made to grow the post-larval forms in the Laboratory, and it was found that they flourished quite well in aquarium tanks, provided the water was changed daily and the animals fed regularly. Minced meat of the common anomuran, *Emerita asiatica* was given as routine food. Growth was found to be remarkably rapid. The post-larvæ undergo the first moult in four to eight days after metamorphosis, each moult being accompanied by a distinct increase in size. Further moults for the same species take place at definite intervals, subject however, to slight variations. While the interval between successive moults is different for different species, it becomes longer with age in every species. Measurements were taken after each moult and we now have data as to the rate of growth and the interval between moultings in a number of species. The time at which the gonads become mature is also being ascertained. Specimens over six months old are at present living in the aquarium tanks and observations are being continued. The following table which gives the information at present available, records the age and size after each moult for six species:—

		Final pelagic larva	Post-larva	1st moult	2nd moult	3rd moult	4th moult	5th moult	6th moult	7th moult	8th moult	9th moult	10th moult
S. nepa ..	Age*	..	..	5	10	15	20	26	34	44	77	114	146
	Size*	24	17	20	23	29	35	41	52	63	72	83	96
S. wood-masoni ..	Age	..	..	5	10	15	21	24	38	47	64	98	..
	Size	36	22	24	30	34	42	52	62	73	83	92	..
S. raphidea ..	Age	..	..	4	9	14	19	26	36	45	57	71	..
	Size	19	15	19	24	29	34	42	52	62	73	83	..
S. holoschista .	Age	..	..	6	14	24	35	45	56	68	82	..	..
	Size	35	22	24	28	35	42	49	58	67	76	..	..
L. multifasciata ..	Age	..	..	5	13	21	29	43	56	73	90	106	..
	Size	14	9	11	13	17	20	23	27	30·5	33·5	37	..
L. maculata	Age	..	..	8	19	31	42	51	64	..	..	..	..
	Size	23·5	23·5	29	55	41	48	56	66	..	..	..	..

* Age, in days, after metamorphosis; and size, the maximum length in mm.



Growth stages of *Squilla holoschista* Wood-Mason.
(Almost natural size)

1. Final pelagic larva. 2. Post-larva, 12 hrs. old. 3. Post-larva, 4 days old. 4—8. Later stages after successive moults from 1st to 5th.

The accompanying photograph represents growth stages of *S. holoschista* from the final pelagic larva upto the fifth moult after metamorphosis.

The phenomenon of moulting itself is extremely rapid and is completed in a surprisingly short time. A detailed account of the work will be given shortly.

University Zoological Research Laboratory, Madras, K. H. ALIKUNHI.
March 3, 1943. R. GOPALA AIYAR.

1. Alikunhi and Aiyar, *Curr. Sci.*, 1942, **11**, No. 2, 56-58. 2. Korai, T., and Tung, Y. M., *Annot. Zool. Jap.*, 1929, **12**, No. 1. 3. Bigelow, R. P., *Bull. Mus. Comp. Zool. Harvard*, 1931, **72**.

METHIONINE CONTENT OF FRESH WATER FISH MUSCLE

METHIONINE is one of the indispensable amino acids required for animal nutrition. An assessment of the methionine and other amino acid contents of foodstuffs is necessary for an accurate evaluation of the nutritive value of food proteins. A preliminary examination of the methionine content of some fresh-water fish muscles by a slightly modified method of Baernstein[1] has revealed that of the varieties so far examined the muscles of *Cirrhina mrigala* are the richest having a methionine content of 3·45 g. per 100 g. dry material. This compares well with figures for Halibut muscle and Shrimp muscle given by Baernstein.[2] Arranged in order of their methionine content we get

Cirrhina mrigala > *Clupea ilisha* > *Labeo rohita* > *Scieana coiter.*

Dept. of Medical Chemistry, Prince of Wales Medical College, Patna, M. N. RUDRA.
February 13, 1943.

1. *J. Biol. Chem.*, 1936, **115**, 25. 2. *Ibid.*, 1932. **97**, 663.

PETROLEUM AS A SOLVENT FOR MOUNTING MEDIA

R. A. GROAT[1] in his paper on "Two New Mounting Media Superior to Canada Balsam and Gum Damar" has studied the various solvents that could be used. He has tried the lower boiling petroleum distillates like petroleum ethers, ligroins and benzines, as well as other solvents like xylene, toluene, benzene and chlorobenzene, and finds that from considerations of cost, purity, inertness and insolubility of stains in the solvent, toluene is by far the best solvent and is slightly less expensive than xylol.

In India, at the present time, both these solvents, xylene and toluene are equally costly and unavailable. With the possibility of utilising Dhupa Balsam from *Canarium strictum* instead of Canada Balsam,[2] we thought of substituting the cheaper and more easily available petroleum for xylol. Petroleum distillates over various ranges—between 80°-120°, 125°-140°, 145° C. and above, were collected and tried. The first distillate—below 120° C. was unsatisfactory as it evaporated very quickly. The fraction above 145° was also unsuitable as its rate of drying was very slow. The middle fraction, boiling between 125°-140° C., was found highly suitable. Attempts were made to utilise this fraction in place of xylol, throughout the processes of manufacture of a slide including the grading up of the fixed material. The results have been very encouraging. This fraction of the petroleum seems to have precious little or no action in dissolving away the stains used. Moreover, when compared with xylol it has the advantage of being perfectly neutral and remaining unchanged through any length of time whereas xylol has the tendency of gaining colour with time. One gallon of ordinary petroleum will yield about a pound of the 125°-140° C. fraction.

Intermediate College, Tumkur, B. THIRUMALACHAR.
February 26, 1943. M. K. MADHURANATH.

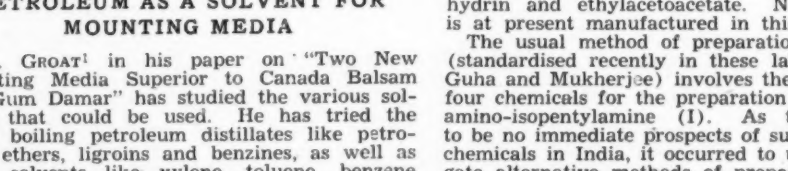
1. Groat, R. A., *Anat. Record*, May 1939, **74**, No. 1, and Suppl. No. 1, May 1939. 2. Thirumalachar, B., "An Indigenous Substitute for Canada Balsam," *Proc. Ind. Sci. Congress*, 1942.

A NEW METHOD OF SYNTHESIS OF δ-*DIETHYLAMINO-ISOPENTYLAMINE* REQUIRED FOR THE MANUFACTURE OF ATEBRIN

THE chief obstacle in the way of preparation of Atebrin in India at the present moment is the scarcity of some important chemicals such as sodium, thionyl chloride, ethylene-chlorhydrin and ethylacetoacetate. None of these is at present manufactured in this country.

The usual method of preparation of Atebrin (standardised recently in these laboratories by Guha and Mukherjee) involves the use of these four chemicals for the preparation of δ-diethylamino-isopentylamine (I). As there appear to be no immediate prospects of supply of these chemicals in India, it occurred to us to investigate alternative methods of preparation of the amine (I) avoiding the use of the four above-mentioned chemicals.

It has now been found that this amine (I) can be obtained by the following series of reactions:—



Chloroacetal prepared from alcohol and chlorine, has been condensed with diethylamine (*Ber.*, 1897, 30, 1504) to give 30 per cent. yield of the acetal (II); and 66 per cent. of unreacted diethylamine is recovered. The hydrochloride of (III) is obtained from (II) in quantitative yields, and condensed with acetone in presence of alkali to form *diethylaminopentenone* (IV), (b.p. 103-5°/30 mm., n_D^{26}, 1·4453) in about 15 per cent. yield. On reduction with hydrogen in presence of Raney's nickel, (IV) furnishes diethylaminopentanone (V) (yield, 80 per cent.) which is converted to the required amine (I) in the usual way. The yields of compounds (II) and (IV) require further improvement to make this process commercially successful.

In order to conserve the costly diethylamine as much as possible, the following reactions, represented schematically below, have been tried:

$$ClCH_2CH(OEt)_2 + CH_3COCH_3 \rightarrow$$

$$\rightarrow ClCH_2CH(OH)\cdot CH_2COCH_3 \rightarrow$$

(VI)

$$\rightarrow ClCH_2\cdot CH{=}CH\cdot COCH_3$$

(VII)

$$NHEt_2$$

(IV)

Attempts to dehydrate the compound (VI); (yield 38 per cent.; b.p. 128°/15 mm.; d_{30}^{30}, 1·086; $n_D^{26\cdot5}$, 1·4151) to (VII) have not been successful, either complete decomposition or resinification taking place.

Organic Chemistry Section,
Dept. of Pure & Applied Chemistry,
Indian Institute of Science, Bangalore,
March 12, 1943.

P. C. Guha.
P. L. Narasimha Rao.
T. George Verghese.

EXCITATION AT THE ANODE AND THE CATHODE

The fact that on closing the current through a nerve, the excitation wave starts from the cathode shows that cations are important agents. How, then, is the fact of excitation at the anode, which occurs on breaking the current, to be explained. It is pointed out by Kieth Lucas (1912) that "the one feature which is common to the cathode when the current is made, and the anode when the current has just ceased to flow, is an increase of the concentration of cations above the value which occurred at each of these points immediately before". At the anode, however, the concentration of cations only rises to its normal level by diffusion, after having been decreased.

Experiments on unstriated muscle have shown, that ions may produce their effects, either excitation or inhibition, after their concentration having been lowered below normal, is again raised to normal, this concentration previous to being lowered, having no such effect. Thus frog stomach may contract if it is at first placed in a solution, free of sodium chloride, and then the concentration of the latter being raised to normal (Singh, 1939); instead of contraction, inhibition may be produced, probably due to the fact that the effect of sodium is inhibitory, and that of chloride excitatory, the result depending upon as to which of these actions predominates. In the guinea-pig uterus, the normal concentration of potassium in the mammalian saline has no appreciable effect; if the muscle is deprived of potassium for ten minutes, its reintroduction produces marked inhibition (Singh, 1942).

The muscle thus accommodates to normal concentration of ions.

Brigade Laboratory,
Allahabad,
January 18, 1943.

Inderjit Singh.

1. Kieth Lucas, *Proc. R. Soc.*, 1912, **85B**, 495. 2. Singh, I., *J. Physiol.*, 1939, **96**, 367. 3. Singh, I., *Ind. J. Med. Res.*, Oct. 1942.

ON THE MOUTH-PARTS OF THE INDIAN GLOW-WORM, *LAMPROPHORUS TENEBROSUS* WLK.

The larval mouth-parts of *Lampyris noctiluca* L. and *Luciola gorhami* Rits. have been worked out by Haddon, K. (1915) and Mehta, D. R. (1932) respectively. Paiva, C. A. (1919) and Hutson, J. C., and Austin, G. D. (1924) have described only the habits and life-history of the Indian Glow-worm, *Lamprophorus tenebrosus* Wlk. The mouth-parts of this form have not been worked out in detail till now.

The following observations were made from material collected from the College premises, Tambaram, Chingleput Dist. The adult male head is hypognathous and the mouth-parts are mandibulate with minimum growth of hairs. The larval and female head is prognathous and highly retractile. The head capsule is smooth and dorso-ventrally flattened with the epicranial suture well-emphasised. The labrum is an inflexed plate forming the roof of the buccal cavity. The mandibles are strongly falcate with double condylar articulations with the head capsule. The maxillæ are fused into a compound labio-maxillary plate, the major portion of which is formed by the stout stipites. The female mouth-parts resemble those of the larva but slightly modified. The larval mouth-parts are wonderfully adapted for attacking and consuming the snails (*Ariophanta ligulata*, *A. bistrialis*, etc.) on which they feed. The maxillary palp is 5-jointed in the male, 4-jointed in the female and 3-jointed in the larva. The labial suture is conspicuous and the labial palp is 2-jointed throughout. The mouth-parts of the larva are characterised by the enormous development of hairs all round

the mouth, the presence of distinct brush-like structures on the labio-maxillary plate, the occurrence of a mandibular canal, the formation of a filter mechanism in front of the

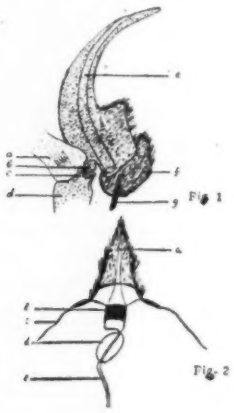


FIG. 1. Right mandible—Ventral view (Larva)

a.—Antenna; *b.*—Postartis; *c*—Postcoila; *d*—head-capsule; *e.*—Mandibular canal; *f*—Prostheca; *g*—Chitinous rod for attachment.

FIG. 2. Hypopharynx and pharynx (Larva)

a.—Median groove; *b.*—Prepharynx; *c.*—Attachment to head capsule; *d.*—Pharynx ("Postpharynx") *e.*—Oesophagus.

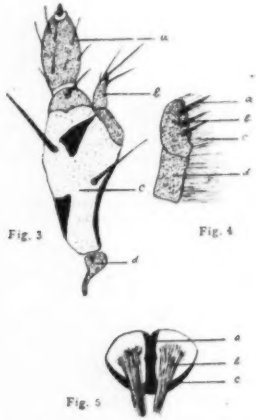


FIG. 3. Left maxilla—Dorsal view (Larva)

a.—Maxillary palp; *b.*—Galea; *c.*—Stipes; *d.*—Cardo

FIG. 4. Maxillary lacinia (Larva)

a.—Spine; *b.*—Apical joint; *c.*—Hairs; *d.*—Basal joint.

FIG. 5. Prelabial armature—Dorsal view (Larva)

a. & *c.*—Triradiate Sclerite; *b.*—Prelabial brush (Diagrammatic).

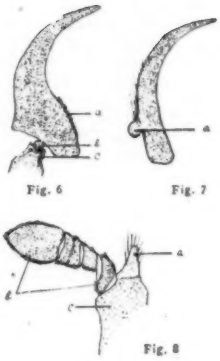


FIG. 6. Right mandible (♀)

a.—Reduced basal brush: *b.*—Postartis: *c.*—Postcoila.

FIG. 7. Right mandible (♂)

a.—Postartis.

FIG. 8. Right maxilla—portion (♂)

a.—Galea; *b.*—Maxillary palp: *c.*—Stipes.

mouth and the presence of a conspicuous hairy sheath attached to the base of the mandible serving as a filter for the liquid food. The prelabium is provided with a conspicuous triradiate sclerite which supports a posteriorly directed prelabial brush. The food is crushed in the larva by the stiff hairy tufts and taken in the liquid state both through the mandibular canal and the mouth opening, exactly as in the larva of *Lampyris noctiluca*. The buccal cavity leads into the pharynx which is differentiated both in the adult female and larva into an anterior strongly chitinised prepharynx and a posterior membranous sac. It is interesting to note that while the larvæ are voracious feeders on snails, the adults take little or no food.

Zoology Department,
Madras Christian College,
Tambaram, J. SAMUEL RAJ.
January 16, 1943.

FIRST RECORD OF THE SEXUAL FORMS AND OVIPAROUS REPRODUCTION OF WOOLLY-APHIS, *ERIOSOMA LANIGERUM* HAUSM. FROM KASHMIR, INDIA

THE woolly-aphis (*Eriosoma lanigerum* Hausm.), a native of the eastern half of N. America, gradually spread, to become a pest of apple (*Pyrus malus*), in most other apple-growing tracts of the world. Owing to changed environmental conditions and absence of American Elm (*Ulmus americana*) the behaviour and life-history of the aphis altered considerably in its new habitat.

In India, the woolly-aphis was found well established as early as 1891 (Atkinson)[1] and has at present assumed pest form in all the apple-growing tracts of the sub-continent. Detailed life-history studies made and reported so far in India make no mention at all about the existence of sexual forms and oviparous reproduction. The authors in their study of the aphis during the past three years have established their presence and their observations confirm those of other workers in the West.

In Kashmir, the apterous aphis (found on apple) reproduces asexually and the winged form appears twice a year—May-July and August-November. The winged forms appearing in the former period develop from the apterous colonies and their number remains small throughout. They live from five to six days and reproduce asexually nymphs which resemble those of apterous forms in all respects. In this respect these winged forms are like the spring-winged form found in America and are capable of spreading the infection by their flight from one locality to another. The second instalment of winged form which appears in the latter period (end of August-November) is found in very large numbers for about two months. Four to seven nymphs are laid by a single-winged aphid during its average adult life of six days. The nymphs are peculiar in being devoid of mouth parts; five antennal joints are present throughout life; sexes can be differentiated by means of size, colour and structure. The male (0·55-0·60 mm.) is smaller than the female and has a reddish-brown-purplish tinge; the fourth and fifth antennal joints have each a prominent sensorium; the labium is absent and the trophic tubercle is vestigial; the terminal segments of the abdomen are prominently hairy; the claspers are small and curved and the aidegus protrudes in between.

The female (0·7-0·9 mm.) is reddish-brown in colour and has a larger width of body. A single egg is easily seen in the abdomen from its very early stages and with age the egg becomes more marked.

The male is short-lived (twelve days) while the female survives for a period of about twenty days. Both moult regularly four times at an interval of three to four days; the female dies in the process of laying her egg; the egg is deposited near the crown of the root of the apple plant, being light-brown and later becomes deeper coloured, and long (0·32 mm.) and ovoid in shape.

Gratitude is expressed to the Imperial Council of Agricultural Research and His Highness' Government, Jammu and Kashmir, who are financing the Research Scheme on the San-Jose Scale and woolly aphis in *Kashmir*.

Dept. of Agriculture,
Srinagar,, Kashmir, M. R. FOTEDAR.
February 10, 1943. A. P. KAPUR.

1. Atkinson, *Ind. Museum Notes, Calcutta*, **1891**, **2**, 52.

THE AERIAL ROOTS OF *PLUMERIA ACUTIFOLIA* POIR.

Plumaria acutifolia (Apocyanaceæ), commonly known as "Pagoda tree", is characterised by false dichotomous branching and parallel veined leaves.

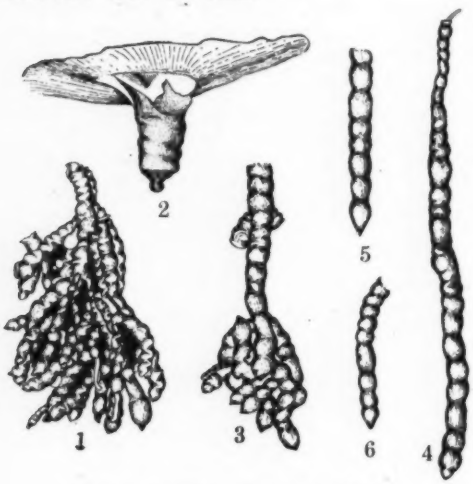
An interesting feature of the plant is the occurrence of aerial roots on the under-surface of the branches, commonly noted on plants over six feet in height. As a rule, the roots appear with the break of the monsoon, when new leaves arise after defoliation. The aerial roots remain active till the end of the rainy season when they become dried and shrivelled and remain as entangled mass of dark filiform processes.

Aerial roots are present only on the under-surface of the obliquely growing branches. In a few instances they occur on the upper surface of the stem, particularly in regions where more than two branches bifurcate. They have not been found to come out through the lenticels. They always occur in isolated patches and are never present on current year's shoot but are abundantly developed on previous year's branches and appear as a "coralloid mass" (Fig. 1). Their development appears to be as follows:—A single root (4 to 8 mm. in thickness) pierces the stem and after growing for a distance of a centimetre or two stops development (Fig. 2). It has a constricted appearance and the proximal portion develops a green colour while the distal portion remains white and the tip though somewhat swollen has the normal appearance. Very soon the tip dries up and becomes blackish-brown in appearance. Lateral roots then develop, which again after growing for 1 to 3 centimetres become arrested in development and these in their turn give out lateral roots (Fig. 3). In this way a large number of delicate roots become aggregated in a corallcid mass. In rare instances a comparatively thinner primary root was seen to remain unbranched, and to grow for a distance of 2 to 4 centimetres and then stop development (Fig. 4). A characteristic feature of these aerial roots is their moniliform appearance (Figs. 5 and 6).

The growth and development of the roots is not continuous but intermittent. Under drought conditions the tips of the roots dry up, and with the fall of the rain, lateral roots are again given out. If, however, the dry spell is not of sufficient duration, the tip does not dry up and the individual root continues development, and shows an increase in length (Fig. 4). Once the tip gets shrivelled further growth in length is arrested and lateral roots are given out which, as usual, are endogenous in origin.

Particularly when the atmospheric precipitation is very high, root hairs are produced in the younger roots. They are produced in acropetal succession and occur from the first swollen region of the root to a few millimetres behind the apex, which is covered by a root cap. The root hairs have an average length of 179 microns and show the usual features.

They are not present in the older roots and disappear after the rains.



FIGS. 1-6. Explanation in text. (× 5)

Anatomical study of the aerial roots show the presence of a large cortex and a central stele with exarch vascular bundles. There are eleven primary protoxylem and protophloem elements. Secondary growth occurs mainly in the primary roots. It is of very short duration and a complete woody cylinder is not formed. A notable feature of the primary roots is the presence of isolated medullary strands in the central region of the stele.

The formation of periderm takes place in all the roots in course of time. Lenticels occur only on the comparatively thicker primary roots, and they are entirely absent on the younger roots.

Akhtar[1] seems to be the only worker who has recorded the occurrence of aerial roots of *Plumaria acutifolia*. He does not, however, mention the occurrence of root hairs. Root hairs have been found to be present in the adventitious aerial roots of Sorghum by Vijayaraghavan and Rao[3] and they are of opinion that these serve as organs for absorption. Root hairs are also found to occur in the aerial roots of Banyan during rainy season. Recently Thirumalachar and others[2] have recorded the presence of root hairs on the aerial roots of *Heptapleurum venulosum*. These are thick-walled, and show characteristic serrations. They act both as anchoring and absorbing organs. In the material studied root-hairs are produced only during very humid weather and as such undoubtedly act as organs for the absorption of liquid water which accumulates in the capillaries produced by the close association of a large entangled mass of filiform roots.

Anatomical evidence reveals that the moniliform appearance of the younger roots is due mainly to the very great enlargement of the cortical cells in the regions where transverse fissions have taken place in the periderm. The initial increase in the size of the cortical cells produces a radial pressure on account of which the periderm is ruptured at certain regions. At these regions the cells become much larger in size on account of the relaxation of the pressure, whereas in regions where the periderm remains intact the cells are unable to enlarge. It is at these regions that the constrictions are noted. Repetition of this process appears to give a moniliform appearance to the root. Fig. 7 illustrates the point very clearly. It will be seen that the periderm

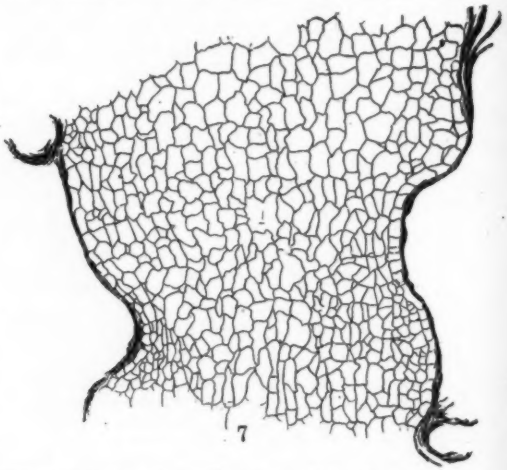


FIG. 7. L.S. through portion of a moniliform root. (× 30)

is disrupted at the regions where the swellings occur. The size of the cortical cells in the constricted and non-constricted regions also supports this interpretation. It is, however, difficult to state at this stage of the investigation why the rupture of the periderm takes place so regularly and periodically in these roots. The author is led to believe that this may have something to do with the variation of the humidity of the atmosphere.

My thanks are due to Prof. G. P. Majumdar for helpful suggestions.

Department of Botany,
Calcutta University, I. BANERJI.
February 3, 1943.

1. Akhtar, A. R., *Proc. Ind. Sci. Cong.*, **1930, 17,** 290.
2. Thirumalachar, M. J., Swamy, B. G. L., and Khan, K. B. A., *Jour. Bombay Nat. Hist. Soc.*, **1942, 43,** 276.
3. Vijayaraghavan, C., and Rao, V. Panduranga, *Curr. Sci.*, **1938, 7,** No. 1, 20.

A PROLIFIC PLANT IN JOWAR *HOLCUS (ANDROPOGON) SORGHUM* BROT.

AN abnormal Jowar plant was found growing in a rose hedge in the writer's house in Poona. The plant was self-sown one and had attained

a height of 14·5 ft., with a large number of ear-heads. The plant bore in all seventeen heads from the seven upper nodes (12th to 18th). The main stem terminated in a large head. The emergence of the heads was from the apex towards the base. Secondary branches were also formed in the upper nodes. Adventitious roots were noted in 12th, 13th and 14th nodes. The plant was further interesting in that it produced ten tillers including

the one described above. This kind of growth is very rare in this species of Holcus.

Poona,
January 9, 1943. G. B. PATWARDHAN.

Ed. Note: It is since reported very regretfully that the seeds of the plant were destroyed partly by birds and partly by rats in store.

ON THE VARIATION IN THE RATE OF ELONGATION OF THE COLEOPTILE OF ZEA MAYS

C. V. KRISHNA IYENGAR[1] has recently reported that the rate of elongation of maize coleoptile shows a fluctuating course when measurements are carried out at ten-second intervals with a magnification of 3,000. He is inclined to believe that the autonomous activity of the growing organs showing a pulsating nature (Bose, 1927) and the rhythmic change of potential in the plant body at short intervals as explained by Bose (1923) might indicate the occurrence of variation in the turgidity of the plant body even at short intervals; and this variation in the turgidity might account for the fluctuations in the rate of elongation of the coleoptile.

While this explanation may be correct the writer is puzzled by the following few questions and hopes that the author will throw light on the same.

How rigorous was the control of external conditions in this experiment? The author states that "the temperature was uniformly about 74° F.". No mention, however, is made of the relative humidity of the air and the constancy of illumination. A brief indication of these would have carried conviction. It is needless to point out that a very rigorous control of external conditions is absolutely essential in a delicate work of this type. Is it possible that the accuracy of measurements of such minute growth-rates can be vitiated by the nutations of the coleoptile? This difficulty is met with particularly when measurements are made with an auxanometer or a kathetometer and is emphasised, for instance, by Du Buy[2] in his work on the growth of the coleoptile of *Avena sativa*.

Pusa,
February 1, 1943. R. D. ASANA.

1. *Curr. Sci.*, **1942**, **11**, 443–444. 2. *Rec. Trav. bot. neerl.*, **1933**, **30**, 858.

ASSAY OF INDIAN ERGOT

WITH the exception of ergot found on certain species of grasses near the Simla Hills,[1] medicinal ergot growing on rye has not been reported from India. Recently, Mr. K. M. Thomas of the Mycology Department, Agricultural Research Institute, Coimbatore, South India,[2] has successfully grown ergot on rye plots in the Nilgiri hills following the method originally advocated by Hynes,[3] and referred to in detail by Mukerji and Bose.[4] Through the courtesy of Dr. J. N. Ray, Director of Production (Drugs and Dressings), Office of the Director-General, Indian Medical Service, the Biochemical Standardisation Laboratory was afforded the opportunity of examining this specimen of ergot artificially grown for the first time in India. The medicinal importance of Ergot and shortage of the drug during wartime in India justify the publication of the analytical figures obtained.

1. *Botanical Examination*:

Length of sclerotia = 2 to 3 cm. Smallest size = 1 cm. Some sclerotia are cylindrical with a thick base and nearly pointed tip, others are markedly curved. Appearance—dark coloured hard structures, 4 to 5 mm. thick with a yellowish core.

The length of sclerotia imported from Europe varies from 1 to 3 cm. These are nearly cylindrical, slightly curved with longitudinal furrows and externally dark brown with a pinkish core.

Transverse section: The outer portion consists of small dark-coloured cells, the colour of which is changed to brownish red on the

addition of H_2SO_4. The rest of the sclerotium consists of nearly colourless, closely compacted, very small oval or rounded cells.

Imported sclerotia of ergot also shows more or less similar appearance.

Odour and taste, characteristic.

2. *Chemical Examination*:

(*a*) Assayed according to the method outlined in B.P. 1932 and Addendum 1936 to B.P. 1932,[5] the colour developed with a solution of dimethylamino-benzaldehyde being compared with the help of a Zeiss Pulfrich Photometer for accuracy of colour matching.

Found: Total Alkaloids of Ergot, 0·13014 per cent. (*i.e.*, 130·14 mg. per 100 gm.) [B.P. specification, 0·05 per cent. (i.e., 50 mgm. per 100 gm.)].

(*b*) In view of the importance of the new water-soluble alkaloid of Ergot (Ergometrine, Moir[6]), the water-insoluble (Ergotoxine—Ergotamine group) and water-soluble (Ergometrine) alkaloids present in *Indian* ergot were separately estimated by the method of Hampshire and Page.[7]

Found: Total alkaloids (calculated as Ergotoxine) = 0·1213 per cent. (121·32 mg. per 100 gm.) Water insoluble alkaloids (calculated as Ergotoxine) = 0·1169 per cent. (116·9 mg. per 100 gm.). Water soluble alkaloids calculated as Ergometrine) = 0·0237 per cent. (2·37 mg. per 100 gm.).

3. *Pharmacological Examination*:

Broom and Clark method[8] of assay, with rabbit uterus (parous rabbit uterus dissected into strips of approximately equal length and thickness) and with ergotoxine ethanesulphonate (1 in 30,000) as *standard*, was used. The observations suggest that the content of ergotoxine in the liquid extract prepared from Indian ergot according to B.P. process would lie between 0·085 and 0·145 per cent., and that the mean of 0·115 per cent. would not probably be far from the true value of ergotoxine content in the liquid extract.

There is no suitable biological method for estimating the ergometrine content of ergot specimens. The method of Brown and Dale[9] could not be employed. The content of ergometrine could not, therefore, be biologically confirmed.

The analytical data clearly show that Nilgiri ergot satisfies all requirements laid down in the B.P. This conclusion is strengthened by several analyses of ergot sclerotia carried out previously in the B. S. Laboratory and elsewhere.[10] The total alkaloidal content of imported ergot was found in six assays to vary between 0·010 to 0·110 per cent. Swiss workers reported a much wider variation (in thirty assays) of total alkaloidal content of European ergot (fresh) between 0·000 to 0·200 per cent.

The opinion may, therefore, be expressed that ergot artificially produced in India on rye is of good quality with adequate total alkaloidal content and has developed both the water-insoluble (Ergotoxine group) and water-soluble (Ergometrine) alkaloids in suitable proportions for therapeutic utilisation. It is in certain respects better than many batches of imported ergot with comparatively poor alkaloidal contents.

Botanical study was conducted by Mr. A. B. Bose and part of the pharmacological study by Dr. N. K. Dutt and Dr. B. Chowdhury. Dr. I. B. Bose carried out the assays on imported ergot sclerotia when he was stationed at Calcutta.

Dr. Venkatachalam and Mr. Ratnagiriswaran[11] of the Research Unit, Medical College, Madras, carried out independently a chemical and biological assay of this ergot directly sent to them by Mr. Thomas. The results obtained by these workers, though slightly on the higher side, corroborate our finding in that the Nilgiri ergot is at least of the B.P. quality, if not better.

Biochemical Standardisation Laboratory,
Government of India,
Kasauli and Calcutta,
January 28, 1943.

B. MUKERJI.
N. K. DEY.

1. Pushkar Nath and Padwick, *Curr. Sci.*, **1941, 10,** 488. 2. Thomas, *Science and Culture*, **1942-43, 8** (in press); *Mad. Agri. J.*, **1942, 30,** 411. 3. Hynes, *Pharm. Jour.*, **1941, 147,** 172. 4. Mukerji and Bose, *Science and Culture*, **1942; 8,** 267. 5. General Medical Council, London, *British Pharmacopœia First Addendum*, **1932-1936,** 151. 6. Moir, *Brit. Med. Jour.*, **1932, 1,** 1119. 7. Hampshire and Page, *Quart. J. Pharm. and Pharmacol.*, **1936, 9,** 60. 8. Broom and Clark, *J. Pharm. Exp. Therap.*, **1923, 22,** 59. 9. Brown and Dale, *Proc. Roy. Soc., Ser. B.*, **1935, 118,** 446. 10. Sandoz Laboratory, *Modern Therap.*, No. 7, p. 8. 11. Venkatachalam and Ratnagiriswaran, Personal communication to B. M.

ON THE PRE-SOWING TREATMENT AND PHASIC DEVELOPMENT

RECENTLY an interesting article on pre-sowing treatment and phasic development was published by Dr. Chinoy[1] which I have read with interest. In this connection I wish to place on record the results of pre-sowing treatment of the rice plants carried out in the Botanical Laboratory, Ravenshaw College, Cuttack, for the last four years, the preliminary report of the results and seed treatment having already been detailed in the Progress Reports of Orissa Rice Research Scheme, 1937-38[2] and 1940-41.[3] It was therein reported that the treated plants flowered 8 to 10 days earlier than the controls.

The seed treatment adopted by Dr. Chinoy is on the same line as detailed by the author for the rice plants, and is as follows:—Seeds are soaked in water for 24 hours, when the basal portion of the lemma at the midrib becomes opaque, indicating the swelling of the embryo. The seeds are then taken out, air-dried for 6-8 hours, placed in an electric oven at 40° C. to 42° C. for 24 hours, after which they are taken out and sowed along with the controls. Even at the seedling stage the treated and the untreated seedlings manifested differences in drought resistance. An observation recorded on 17-11-42 is as follows:—By 10-30 a.m. large number of plants had wilted

in the control and only two to three among the treated plants. By 2 p.m., all the plants in both the treated and untreated had wilted. Five hundred c.c. of water were added to each of the pots. After five minutes 32 plants in the control and 11 in the treated still remained wilted. After fifty minutes all the plants in the treated had recovered while 6 plants in the controls still remained wilted.

The seedlings were transplanted in tin pots containing 4 kilograms of soil, to which 1,000 c.c. of water was added to keep the soil at 25 per cent. level of moisture content. The treated and control seedlings were transplanted in 25 pots of each. After the plants were established the surface of the pots was covered with cellophane paper with a central hole of 1 sq. inch for the plant. These 25 plants in each were divided into three series of 8, 8 and 9, with 8, 10 and 12 days interval of watering respectively. At the time of watering the pots were weighed and the loss of weight was recouped to bring the pots to 25 per cent. level of moisture content again. This procedure was continued till the time of harvest when the whole plant was cut excluding the roots. Water requirement of each plant was calculated by dividing the total quantity of water transpired by the weight of the dry matter. The results of the experiments in 1941 winter season were sent to the statistical laboratory, Calcutta, where they were analysed and the results are given below.

TABLE I

Total Water Transpired (in grams)

Crop: Paddy

Intervals of watering	Control		Treated		Control − Treated	Fisher's "t"	D.F.
	N	Mean	N	Mean			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
8 days	6	4960	8	5176	−216	239	35
10 ,,	7	7563	8	6898	665	·767	,,
12 ,,	5	6999	7	6859	140	·143	,,

S.E. = 1675. G.M. = 6393. S.E. per cent. = 26·2.

TABLE II

Dry Weight of Tops (in grams)

Intervals of watering	Control		Treated		Control − treated	Fisher's "t"	D.F.
	N	Mean	N	Mean			
(1)	(2)	(3)	(4)	(5)	6	(7)	(8)
8 days	6	2·67	8	3·83	−1·16	1·378	35
10 ,,	7	4·74	8	5·84	−1·10	1·364	,,
12 ,,	5	4·81	7	5·36	−0·55	0·603	,,

S.E. = 1·558. G.M. = 4·59. S.E. per cent. = 33·9.

TABLE III

Yield of Grain (in grams)

Intervals of watering	Control		Treated		Control − treated	Fisher's "t"	D.F.
	N	Mean	N	Mean			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
8 days	6	·595	8	1·066	−·471	2·197	25
10 ,,	7	·736	8	·722	·014	·068	,,

S.E. = ·3968. G.M. = 0·794. S.E. per cent. = 50·0.

TABLE IV

Water Requirement

Intervals of watering	Control		Treated		Control − treated	Fisher's "t"	D.F.
	N	Mean	N	Mean			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
8 days	6	1526·7	8	1093·9	427·8*	6·000	35
10 ,,	7	1389·9	8	1089·5	300·4*	4·398	,,
12 ,,	5	1455·0	7	1282·6	172·4*	2·230	,,

S.E. = 132·0. G.M. = 1284·1. S.E. per cent = 10·3.

The following conclusions may be drawn from the statistical analysis:—

1. The water requirement for treated plants is significantly less than for the controlled plants for each interval of watering (Table IV).
2. The yield of grain for treated plants is significantly greater than for the control plants when the interval of watering is eight days (Table III).
3. Treated plants have more dry weight of tops than control plants but the difference is not statistically significant (Table II). Similar observation was also made in a field experiment tried with treated and untreated seed.

Botanical Laboratory,
Ravenshaw College, P. PARIJA.
Cuttack,
December. 12, 1942.

1. *Curr. Sci.*, **11**, No. 10. 2. *Orissa Rice Research Scheme Progress Report*, 1937–38. 3. *Ibid.*, 1940–41.

EVIDENCE OF DISTRIBUTION OF FISHES REGARDING RISE IN SALINITY OF THE RIVER HOOGHLY

IN his recent work on "Deltaic Formations, with special reference to the hydrographic processes of the Ganges and the Brahmaputra", Strickland[1] has referred to two diverging views regarding the salinity of the waters of the River Hooghly. From figures of salinity of the river water at Cossipore Electric Power Station, Calcutta, from 1925 to 1937, supplied

by Mr. Kilford of the Calcutta Port Commission and quoted by Strickland, it is clear that the salinity is rising. Mr. Oag of the Calcutta Port Commission is, however, of the opinion that Mr. Kilford's figures indicate an ephemeral phenomenon only and after an historical study of old records he has concluded that the Hooghly has improved during the past 100 years.

From a study of the distribution of fishes found in the River Hooghly above Calcutta, Prashad[2], and Hora and Nair[3] have shown that the salinity of the water of the River Hooghly is gradually increasing and this is explained by Prashad by the fact that "the flow of fresh water downstream is unable to counteract the influence of the tides to the same extent as it was before the present deterioration of the river".

The occurrence in the River Hooghly of bottom fishes of marine or estuarine genera, such as *Platycephalus, Cynoglossus, Pseudorhombus, Odontamblyopus, Pseudapocryptes* and *Apocryptes*, far inland above tidal influence is to my mind a clear indication of the penetration of a bottom wedge of brackish water, especially during the hot and dry months. It may be pointed out in this connection that in recent years hydrobiological work in estuaries in America and the East Indies has shown that a large or a deep river entering the sea has a bottom layer of salt water, which extends upstream in a wedge of diminishing thickness until it is entirely replaced by fresh water. As the fresh water is much lighter than sea water, it forms a layer over the salt water, but the layer gets gradually thinner as the force of the flow of the river water is lessened by the effect of tides, currents, etc. It is also dependent on the volume and force of the fresh water brought down from above.

Special attention may here be invited to the distribution of the following species of salt-water fishes found in the River Hooghly far above Calcutta.

Platycephalus indicus (Linnæus) was not known to Hamilton[4], who made extensive collections in the River Hooghly, both at Calcutta and lower down, from 1798 to 1814; it was found as high up as Uchitpur. Several specimens were also collected at Pulta and Chandernagore, and at the present day the species appear to be not uncommon in this part of the river. Francis Day[5], who made extensive collections of fish in India from about 1860 to 1876, gave the distribution of *P. indicus* (= *P. insidiator*) as "Red Sea, East Coast of Africa, seas of India to the Malay Archipelago and beyond". I have not seen it recorded in literature from fresh waters, except by Mori[6], who lists it among the fresh-water fishes of the Yangtse-Kiang, a large river with a big estuary where conditions of salinity are probably similar to those in the River Hooghly.

Sphæroides oblongus (Bloch) was found at Pulta. This fish was not found by Hamilton in the Ganges and Day gave its distribution as "Seas of India to the Malay Archipelago, China, Japan and the South Seas". It was not recorded by Day from Calcutta.

Cynoglossus lingua Hamilton, of which many young specimens were found as high up as Maltipur (the species is not uncommon at Pulta, about 17 miles above Calcutta), was described by Hamilton in 1822. He observed that:

> "By the English of Calcutta it is called a Sole, and equals in quality and size this most valuable fish; but in that city it is not very common, as *it is found only in the estuaries that are strongly impregnated with salt.*" (Italics are mine.)

According to Day, this species is found in the "Seas and estuaries of India", but he figured a specimen from Calcutta. Presumably he purchased it from the market, where estuarine fishes are brought for sale.

Pseudapocryptes lanceolatus (Bloch and Schneider), *Apocryptes bato* (Hamilton) and *Odontamblyopus rubicundus* (Hamilton) were found by Hamilton in the estuaries of the Ganges when he was stationed at Baruipur in the 24-Parganas. According to Day, these species were found at Calcutta in his time, but the past history of the river (see Banerjee's *History and Hydraulics of the River System near Calcutta*) indicates that about 1880 it showed signs of severe deterioration, and presumably in the years preceding this abnormal condition the advancing salt water may have influenced the migration of the estuarine forms to the higher reaches of the river. During my survey of the fish fauna of the River Hooghly in March 1937, *Apocryptes bato* was found as high up as Maltipur, while a few specimens of *O. rubicundus* were taken at Chandernagore. All the three species are now fairly common at Pulta.

The species enumerated above are mostly bottom-living forms and, though they are now capable of tolerating fresh waters, there is hardly any doubt that their original migration upward must have been facilitated by a bottom wedge of salt water. In this connection it seems pertinent to remark that during March-April at the low tide period at several places above the town of Hooghly the water of the river is usually a foot or so deep. This silting up of the bed is probably the result of lack of any fresh-water current from above, which, in the case of other rivers, in whch hydrobiological investigations have been carried out, has been found to have a considerable influence on the distribution of the fauna in the estuaries lower down. The upper section of the Hooghly river seems to be almost like a stationary pool, and in consequence very large number of pond-dwelling forms are found in that portion of the river.

Department of Fisheries, Bengal,
1, Deodar St., Calcutta, S. L. HORA.
January 30, 1943.

1. Strickland, C., *Deltaic Formations*, Calcutta, **1940**, 110–13. 2. Prashad, B., *Rep. Zool. Surv. Ind. for 1935 to 1938*, **1938**, viii–ix. 3. Hora, S. L., and Nair, K. K., *Rec. Ind. Mus.*, **1940**, **42**, 558–59. 4. Hamilton, F., *An Account of the Fishes found in the River Ganges and its Branches*, Edinburgh, **1822**, 1–404. 5. Day, F., *The Fishes of India*, London, **1876**, 277. 6. Mori, T., *Studies on the Geographical Distribution of Fresh-water Fishes in Eastern Asia*, Chosen, **1936**.

REVIEWS

Advances in Enzymology, Vol. II. Edited by F. F. Nord and C. H. Werkman. (Interscience Publishers, Inc., New York), 1942. Pp. viii + 374. Price $ 5.50.

This series has entered its second year and the contents of the present volume are as fundamentally important and interesting as the contributions published in the first volume. The scope of the series, as envisaged in the introduction to the series, has been extended to cover the fields of vitamins and hormones; an article on Vitamin K by its discoverer and an informative review on the adrenal cortical hormones have been included.

Twelve contributions comprise the volume and first of these on bacterial viruses concludes with a highly suggestive discussion of the host-virus relationships. The author has advanced several speculative hypotheses on this fascinating subject which includes the pregnant suggestion that the synthesis of new virus demands not only the utilisation of the storage products of the cell but also the short-lived intermediate products of metabolism. The author adds, "The virus makes use of the metabolic machinery of the cell for its own needs. The oxidation-reduction cycle and the phosphorylation cycle of some cell metabolite may directly be involved. Such a study will require the analysis of the growth of the host and of virus in the presence of a variety of substrates and inhibitors under aerobic and unaerobic conditions. In the opinion of the reviewer, the problem of the autocatalytic synthesis in the cell may be approached in this manner with promise of success".

The kinetics of hydrolytic enzymes and their bearing on methods of measuring enzyme activity, discussed by Van Slyke will prove useful to workers in the field of enzyme chemistry. Bergman has classified the specific interrelationships among the large number of proteodastic enzymes, in the light of his own work. Enzymatic properties of peptidases are reviewed by Johnson and Barger. Special mention should be made of the exceedingly valuable review on the heterotropic assimilation of carbon dioxide contributed by the very same authors who were the first to describe this phenomenon as an experimentally accomplished concept. Those interested in this latest and spectacular advance of biochemistry can, with profit, turn to this stimulating and comprehensive review. Other reviews in the volume include articles on diamin-oxidase—an enzyme not extensively studied, respiratory and fermentative enzyme mechanisms associated with Aspergilli, cellulose decomposition by micro-organisms and a unified hypothesis of the reciprocal integration of carbohydrate and fat metabolism. A highly speculative and laboured review on the chemistry of tea fermentation is also to be found in the volume.

This volume represents an even greater improvement over the first of the series; the publishers deserve all praise not only for the beautiful get-up of the volume but also for their venturesome and praiseworthy enterprise.

Temperature Control. By A. J. Ansley. (Chapman and Hall, Ltd., London), 1942. Pp. viii + 126. Price 13*sh.* 6*d.*

The regulation and control of temperature in any system is an important and frequently needed laboratory technique, the fundamental principles and practice of which are to be found in many texts on experimental physical chemistry, in special monographs, and also scattered in several contributions on pure and applied sciences. Recently an impressive volume of contributions to a symposium on "Temperature—its Measurements and Control in Science and Industry" (covering 1375 pages) has been published by Messrs. Reinhold Publishing Corp., New York, and reviewed in *Current Science*, Vol. 10, p. 415. There is, however, still scope for a handy volume expounding the principles with complete practical details for a judiciously selected number of equipments for the control and regulation of temperatures as used in the laboratories and industries. The book under notice, though it purports to be one such volume, is however, a strange medley of useful but frequently extremely elementary informations, clothed in somewhat cumbrous and inadvertent wordings and of statements which are incorrect. Thus on page 5, regarding vapour pressure control, the author states that "it is superior to the direct expansion of a liquid method owing to the extensive range which can be obtained by increasing or decreasing the liquid charge contained in the sensitive phial or capsule"! Again he states, "The disadvantage of this type is that since vaporisation of the liquid is a straight line function, the differential of the control over a wide temperature range will vary considerably". The book contains many other similar statements. On page 9, in an elementary description of the potentiometric method of measurement of e.m.f. of thermo-couples, it is said that in the null position when the galvanometer G shows no deflection, the e.m.f. of the couple is equal to that of the cell F! The following sentence from page 82 is hard to beat: "The liquid whose *rotary* power is desired is contained in a glass *cylinder* placed horizontally between the relevant optical parts of the *refractometer*" (italics ours).

There are besides quite a few printers' errors and the figure 20 on page 36 is printed upside down. Although the publishers have not been sparing in their usual high standards of printing and production, the book needs drastic revision and correction. RAU.

A First Course in Algebraic Geometry. By B. B. Bagi, Government Officers' Colony, Dharwar, 1941. Pp. vi + 264. Price Rs. 2-12-0.

This book is written by Professor Bagi, a well-known author of several text-books in

mathematics. It has certain distinctive features of its own and is very useful to Intermediate students of our Universities and forms a good addition to college libraries.

K. V. I.

Fighting for What? By Sir John Orr, D.S.O., M.C., F.R.S. (Macmillan & Co., London), 1942. Pp. 89. 2*sh*. 6*d*. net.

Sir John Orr in this book faces the problem of post-war reconstruction with abundant hope and enthusiasm. He would not indeed accept the word "reconstruction", with its suggestion of a return to pre-war conditions. "The old order", he says, "is passing away. ... The world is in the throes of a new birth." The political system has collapsed, witness the occurrence of two world wars within twenty-five years. So has the economic system or lack of system, which underlies the political catastrophe. The advance of science makes it possible to produce more and more wealth with less labour, but in pre-war days the results were less evident in increasing prosperity than in restriction of output and widespread unemployment.

"The primary material essentials of life are (1) food and (2) shelter which includes a house, furniture, clothing and warmth. To these must be added (3) a job, which is a psychological necessity. ... If we are planning for human welfare we must put first things first and concentrate on food, houses and a job. Whatever obstacles prevent us from providing these necessities must be ruthlessly removed."

It is about first of these that Orr, as a distinguished worker in the field of nutrition, speaks with greatest assurance and authority. As a result of scientific research carried out during recent years, "optimum" dietary standards have been established, i.e., the type of diet which is needed to produce good physical development and health in human beings is known. Statements of food requirements have been issued by various authoritative bodies, including the Technical Commission on Nutrition of the League of Nations, and all are in general agreement. These standards provide us with "a yardstick by which we can measure the extent to which diets in common use are adequate for health and estimate the amounts of a given foodstuff needed to bring the diet of a given population up to the standard for health". When the diets which population groups actually consume are investigated, it is found that only a proportion of the world's population consumes a diet which conforms with the ideal standard. This is true even in the United States and England in peace-time. In such countries as India under-nutrition and malnutrition are widespread. Orr quotes a recent dietary survey in Ceylon which showed that a third of the population does not get *enough* to eat. The proportion in India is about the same.

So far, so good. We may accept Orr's analysis of the situation as substantially correct. What is to be done about it? Orr outlines a post-war food policy for Great Britain, based on a National Food Board which in turn will control various Commodity Boards. "The National Board should be responsible for bringing up the national supplies of the main foodstuffs up to the level needed to provide sufficient for everybody and for arranging that sufficient would be available within the purchasing power of everybody. The Board should be voted the necessary funds to carry out these functions and the annual report of the Board would be discussed in Parliament at the time when the funds were voted." Increased demand for food will mean prosperity for the farmer. A world food policy must be drawn up by a supreme economic council, with an international financial organisation to control international trade in food. "Each nation will need to estimate the amount of each of the staple foodstuffs needed to feed its population, keeping in view the dietary habits of the people, and then decide which can be most profitably produced at home and which most profitably imported in exchange for exports which it can produce more easily than the food it needs to import."

Orr's statement of the *need* to face post-war problems boldly on an international scale and with the full resources of science is admirable, but in so short a book he has been able to sketch his constructive proposals only in outline. The science of nutrition deals with uncontroversial facts, drawn from scientific observation and experiment. It is far otherwise with economics. All suggestions for the reform of existing economic and political systems are of their very nature bitterly controversial. An author who enters this field has no body of ordered facts on which to draw. In any "History of Human Error" a prominent position would have to be given to ideas about political economy which have been accepted as axiomatic by intelligent and instructed men. "The marginal propensity to consume", "the principle of effective demand"—these and numerous other concepts of the economists doubtless mean something, but they do not seem of great help in constructing a better world. The ordinary man—and in this particular context Orr is an ordinary man—has reacted against the complicated arguments of the professors by getting hold of one simple idea. It is that the application of scientific methods in agriculture and industry now makes it possible for the world to produce an abundance of the necessities of life for all mankind. The necessary wealth can be produced, provided an efficient and equitable system of distribution can be evolved. While this idea is no doubt in many respects naive and—to use an overworked word—utopian, it has a great appeal to scientific workers who are impatient to close the gap between scientific knowledge and its application. But scores of thorny and tortuous obstacles—financial, social and psychological—lie between the goal and the grim realities of the existing world. How can the economics of abundance be reconciled with human nature, with national boundaries and tariffs, with legitimate profits, with the vast differences in industrial and

educational development which exist in the different countries of the world? One could readily add twenty more such questions.

Orr's book is in many respects stimulating and inspiring, particularly in its insistence that when the war has been won a great opportunity awaits mankind to plan its economic and political life on a sounder basis. It is by pointing out the absurdities and failures of the present systems and by clearly describing the ideal which scientific development makes theoretically possible rather than by elaborating concrete constructive proposals, that such minds as his can make their most useful contribution to post-war development.

W. R. A.

Report on the Fish and Fisheries of Lake Nyasa. By C. K. Ricardo Bertram, H. J. H. Borley and Ethelwyun Trevavas. (The Crown Agents for the Colonies, 4, Millbank, London), 1942. Pp. 181. Price 12/6.

This paper is the report of a Fishery Survey that was conducted on Lake Nyasa during 1939 in conjunction with the Nyasaland Nutrition Survey. The three authors of the report formed the members of the Survey. Lake Nyasa is the third largest of the African lakes and is 350 miles long and about 50 miles wide at its widest part. It occupies about a third of the whole of Nyasaland. During the Nutrition Survey by Dr. B. S. Platt it was realised that no economic or dietetic improvement for the people of Nyasaland could be planned without a programme for the rational exploitation of the natural resources of the Nyasa lake. As a result of this the fishery survey was undertaken.

The report embodies a detailed account of the fishes of the lake, their description, economic importance, distribution, methods of capture, size and feeding and breeding habits. Among important food fishes are the species of *Tilapia, Labeo, Barbus, Bagrus* and *Clarias*. A list of all the species with local names has been given in the order of economic importance. The condition of the various fisheries of the lake has been discussed. There are two European fishing stations working on the lake. A large portion of the fish from these fisheries is exported. At present fish in fresh condition is not available for the local population living more than about three miles away from the lake shore. According to the report, just a fraction of the local population living near about the shores of the lake, is engaged in fishing. Organised fishing throughout the year is not done. The existing methods of fishing and fish curing have been described. The appendices at the end of the report contain data regarding hydrographical readings, geographical distribution of fishes, catches from nets and traps, fishing in different seasons and localities, results of curing experiments, fishery regulations, etc. The report is well illustrated with figures and photographs of important fishes and fishing methods of the lake. Reccmmendations have been given for the enlargement and rational exploitation of the fisheries. Though valuable information about fishes, fishing methods and the fisheries of the lake has been recorded in the report, the survey cannot be regarded as complete since it had to be abruptly terminated on account of the commencement of war.

It is clear from the report that lake Nyasa is a vast and productive fishery resource. There is immense scope for its development. It may be suggested that the Government of Nyasaland would do very well to appoint a whole-time officer, well trained in fisheries work, to carry out the suggestions made in the survey report and to organise the development of the fisheries of the lake on sound scientific and technological basis.

B. S. B.

CENTENARIES

Robison, John (1778–1843)

JOHN ROBISON, a Scottish inventor, was born at Edinburgh, 11 June 1778. After leaving the University, he worked for a short time at cotton mills at Manchester and in 1802 he was appointed to a business house at Madras. From there, he entered the Nizam's Services and was chiefly employed in the furnishing of guns ammunition. He also laid out grcunds for the Nizam on the English model. Having acquired a considerable fortune, he left India in 1815 and spent his later life in inventions and other scientific activities such as the secretaryship of the Royal Society of Edinburgh and the founding of Scottish Society of Arts.

He contributed more than seventy papers to scientific periodicals. His inventions were numerous and ingenious. From boring a canon to drilling a needle's eye, nothing was strange to him. He made a marble pendulum for the clock of the Royal Society of Edinburgh, as being less subject to variations due to temperature than metal. He was knighted in 1838. He was always enthusiastic in making known merit among talented artificers.

Robison died, 7 March 1843.

McCoy, Elijah (1843–1929)

ELIJAH McCOY, a Negro inventor, was born in Canada, 27 March 1843. He specialised in the automatic lubrication of machinery. He took more than forty patents, the first of which dates from 1872.

He was a pioneer in devising means for steadily supplying oil to machinery in intermittent drops from a cup, without the need for stopping a machine to oil it. His lubricating cup was in use for many years in the engines of railways and steamships and in factories.

McCoy died in an infirmary, 10 October 1929.

SCIENCE NOTES AND NEWS

Conservation of Wild Life in India.—In his annual address to the National Institute of Sciences of India delivered last January at Calcutta, the President, Dr. B. Prashad, dwelt on the urgent necessity and the measures imperatively needed for the conservation of wild life in India. He made the point that the genesis of this world problem was to be traced primarily to the increasing ascendency of man over his environment. It is only very recently, however, that the existence of the problem has been recognised and the conscience of the world quickened, specially as a result of the efforts of a number of international conferences. The formation and development of many of the world-famous National Parks and Game Sanctuaries have been influenced by the resolutions adopted at these conferences. In 1935, an All-India Conference was convened by the Government of India to review the position and provide protection for the flora and fauna in this country. This Conference laid special stress on the establishment of wild life sanctuaries and also on the need for educative propaganda. A beginning has been made in the establishment of such parks, notably in the U.P., Assam and Mysore. In the field of propaganda, although much pioneer work has been done by a few enthusiastic individuals and scientific bodies—conspicuously the Bombay Natural History Society—it is disappointing that the (only) Indian Journal devoted to this subject, *The Indian Wild Life*, has had to cease publication —temporarily it is to be hoped. In conclusion, Dr. Prashad stressed on the complexity of the problems involved in any scheme of wild life conservation. The conservation of soil, waterways, forests and grass lands is intimately, though not always obviously, bound up with the direct measures for the conservation of wild life. At present for want of data, most conservation programmes in India must of necessity be empirical. Meanwhile, wild life management must be planned on ecological and biological data available, with the aim of preserving not merely a few species of game but the conservation of animal and plant life in general.

The Dictionary of Raw Materials of India.—The Council of Scientific and Industrial Research has arranged for the compilation and publication of a Dictionary of Raw Materials of India. An Editorial Staff working under the direction of an Advisory Committee has been appointed. In spite of the present unsettled conditions a most earnest endeavour will be made to collect all available knowledge regarding the raw materials of the country. An appeal is made to everyone who has any information of value on any aspect of the subject to communicate the same to Dr. B. L. Manjunath, Chief Editor, Dictionary of Raw Materials, 20, Pusa Road, Karol Bagh, New Delhi. Such assistance will be duly acknowledged in the text.

Use of Substitutes for Steel in Reinforced Concrete.—Of various substitutes for steel reinforcement so far tested, bamboo appears to be the most promising for India. Its ultimate tensile strength has been given by various authorities as between 14,000 and 30,000 lbs. per sq. inch, compressive strength between 5,000 and 10,000 lbs. per sq. inch, and Young's Modulus between 1,000,000 and 2,500,000 lbs. per sq. inch. It can be used whole but is recommended cut into thin strips. Placed cross-wise in the form of a mesh, it is suitable for light reinforcement preventing temperature cracks in concrete roads, floor slabs and canal linings. In China, bamboos are required to be three years old before use. In Italy bamboos are given a waterproof coat before use to prevent swelling due to absorption of water. As it is relatively new as a reinforcement no data exist on its durability, but this need not debar its use in purely temporary structures.

Literature on the efficient design of reinforced concrete structures, rigid frames, higher working stresses, pre-stressing and the use of substitutes, is available on loan from the Secretary, Central Board of Irrigation.

Botanical Society of Bengal.—The Seventh Annual General Meeting of the Botanical Society of Bengal was held on Saturday, the 6th March 1943, at 4 p.m., at the Botanical Laboratory, Calcutta University, with Professor S. P. Agharkar, President of the Society, in the chair. The Secretary, in presenting the annual report for the year under review, showed an all-round progress of the Society in spite of the present emergent situation. In delivering his presidential address on the "Practical Applications of Ecology", Professor Agharkar stressed the importance of the environmental conditions as a factor in the successful cultivation of the agricultural crops and forest plants. It was pointed out that only ecological principles would enable us to obtain larger supplies of food and other forest products required for the successful conduct of the war.

The following were duly elected as Office-bearers for the session 1943-44:—

President: Mr. S. N. Bal. *Vice-Presidents*: Prof. S. P. Agharkar, Prof. S. C. Mahalanobis, Dr. K. P. Biswas, Prof. S. R. Bose and Prof. J. C. Sengupta. *Treasurer*: Mr. I. Banerji. *Councillors*: Mr. K. G. Banerji, Mr. E. A. R. Banerji, Dr. P. N. Bhaduri, Dr. N. K. Chatterji, Dr. K. T. Jacob, Miss S. Meyer, Dr. S. K. Mukherji, Mr. P. N. Nandi and Dr. S. R. Sengupta. *Hon. Secretaries*: Dr. B. C. Kundu and Dr. J. K. Chaudhuri.

The Horticultural Society of India.—This Society is formed with the object of advancing the cause of horticulture in India by organising efforts to create facilities for horticultural work in the country and to safeguard the interests of Indian horticulture, by establishing a Central Institution and Provincial Organisa-

tions. It will also publish a horticultural journal and hold general and local meetings with a view to diffusing horticultural knowledge among horticultural workers and the public and facilitating contact between members. Membership is open to all persons interested in any field of horticulture. For further information please write to the Secretary. The following are the personnel of the Executive Committee elected for 1943:—

President: Dr. G. S. Cheema.

Vice-Presidents: (1) Sardar Bahadur Sarda Lal Singh; (2) Mr. Percy Lancaster.

Treasurer: Mr. K. C. Naik.

Secretary: Dr. P. K. Sen.

Councillors: Mr. M. Mustafa (Quetta), Rao Bahadur H. C. Javaraya (Bangalore), Khan M. Aslam Khan (Peshawar), Mr. S. S. Bhatt (Baroda), Mr. M. R. Fotidar (Srinagar), Mr. W. Hayes (Allahabad), Dr. S. Hedayetullah (Dacca), Dr. N. K. Nandi (Shillong), Dr. V. S. Badami (Cuttack), Mr. R. S. Singh (Lucknow), Mr. M. L. Garg (Sahranpur) and Mr. D. T. Desai (Bombay).

The Secretary, Advisory Panel on Drugs and Medicines, Biochemical Standardisation Laboratory (Government of India), writes to us as follows:—

You are perhaps aware that the Government of India have for sometime been considering the question of revising the present method of control of imports of drugs and medicines from abroad to ensure that only the most suitable medicines and in the most suitable quantities are imported under the Import Trade Control Scheme. With this object, they have set up an "Advisory Panel on Drugs and Medicines" with the following terms of reference:—

"To advise the Government of India as to which drugs and medicines, other than those the formulas of which are included in the Official Pharmacopœias of the exporting countries, it is essential to import into India from abroad.

(Note.—The term 'Official Pharmacopœias' includes the British Pharmacopœia, the British Pharmaceutical Codex, the United States Pharmacopœia, and the National Formulary of the United States of America.)

The Panel met at New Delhi on 10th December 1942, and decided to issue a set of Questionnaire to appropriate parties in order to collect representative opinion regarding the drugs and medicines which should be imported into India.

The Panel desires to have the views of all persons, associations or bodies interested in this question with respect to the points mentioned in the terms of reference. It will feel grateful if you will kindly go through the questionnaire and send your replies, under the groups suggested, as early as possible. It is not contemplated that all questions are to be answered by each and every one to whom the questionnaire is being issued. It would be helpful if answers are given against those questions only which are in your field."

Those interested may obtain copies of the questionnaire and related information by communicating with the Secretary, Advisory Panel on Drugs and Medicines, 110, Chittaranjan Avenue, Calcutta.

A CORRECTION

Note entitled "On the Manufacture of Glandular Products in India" (*This Journal*, 1943, p. 61). Dr. U. P. Basu, in a letter dated February 25, 1943, writes:—

"It seems there are two omissions in the manuscript. ..... So, please *insert* the word 'grams' after 100 in the 23rd line, and the expression 'grams of the' after 100 in the 27th line. Thus the yield in question has always been considered in terms of the weight of glands used."

MAGNETIC NOTES

Magnetic conditions during January 1943 were slightly less disturbed than in the previous month. There were 18 *quiet* days, 11 days of *slight* disturbance and 2 of *moderate* disturbance as against 14 quiet days, 16 days of slight disturbance and 1 of moderate disturbance during the same month last year.

The quietest day during January 1943 was the 14th, while the 17th was the day of the largest disturbance.

The individual days were classified as below.

Quiet days	Disturbed days	
	Slight	Moderate
2, 5–11, 13–15, 19, 23–25, 29–31.	1, 3, 4, 12, 16. 18, 21, 22, 26–28.	17, 20.

Two moderate storms were recorded in January 1943 as against none in January 1942.

The mean character figure for the month of January 1943 was 0·48 as against 0·58 for the same month last year.

Magnetic conditions during February 1943 were more disturbed than in the previous month. There were 5 *quiet* days, 22 days of *slight* disturbance and 1 of *moderate* disturbance as against 12 quiet days, 12 days of slight disturbance and 4 of moderate disturbance during the same month last year.

The quietest day during February 1943 was the 28th, while 17th was the day of largest disturbance.

The individual days were classified as shown below:—

Quiet Days	Disturbed days	
	Slight	Moderate
10, 12, 21, 22, 28.	1 to 9, 11. 13 to 16, 18 to 20, 23 to 27.	17

One moderate storm was recorded in February 1943, while none were recorded during the same month last year.

The mean character figure for the month of February 1943 was 0·86 as against 0·71 for February 1942.

M. V. SIVARAMAKRISHNAN.

SEISMOLOGICAL NOTES

Among the earthquake shocks recorded by the seismographs in the Colaba Observatory, Bombay, during the month of January 1943, there were three of slight intensity. The details for those shocks are given in the following table:—

Date	Intensity of shock	Time of origin I.S.T	Epicentral distance from Pombay	Co-ordinates of epicentre (tentative)	Depth of focus
		H. M.	(Miles)		(Miles)
12	Slight	02 20	1390	Lat. 39°. 5 N., Long. 69° 5 E., near Samarkhand.	..
12	Slight	15 35	1390	Lat. 39°. 5 N., Long. 69° 5 E., near Samarkhand.	..
27	Slight	09 15	5890	..	..

Among the earthquake shocks recorded by the seismographs in the Colaba Observatory, Bombay, during the month of February 1943, there were four of slight, one of moderate and one of great intensities. The details for those shocks are given in the following table:—

Date	Intensity of shock	Time of origin I.S.T.	Epicentral distance from Bombay	Co-ordinates of epicentre (tentative)	Depth of focus	Remarks
		H. M.	(Miles)		(Miles)	
6	Slight	04 46	570	..	..	..
6	Slight	09 07	560	..	..	..
9	Slight	03 36	1250	..	..	Epicentral region probably in Assam.
22	Great	15 51	9750	..	..	Epicentral region located in Southern Mexico. Felt in Mexico.
24	Slight	05 50	1910	..	..	..
28	Moderate	19 24	1290	Lat. 39°N., Long. 69°·5 E., to the north of the Hindu Kush mountains.	160	..

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